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Laser Dye Spectroscopy of Some Pyrromethene-BF₂ Complexes

by

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Laser Dye Spectroscopy of Some Pyrromethene-BF₂Complexes

To improve the laser-action properties of the pyrromethene-BF₂ complexes (P-BF₂ complexes), we studied substitution effects at different positions of the dye molecule on the electronic spectra of several derivatives. Specifically, we used laser photoselection spectroscopy to measure the triplet-triplet (T-T) absorption and polarization spectra as well as the fluorescence and visible absorption (S-S) spectra of the following compounds: 1,2,3,5,6,7,8-heptamethyl; 8-acetoxymethyl-1,3,5,7-tetramethyl-2,6-diethyl; 1,3,5,7-tetramethyl-8-*p*-methoxyphenyl; 3,5-dimethyl-1,7-diphenyl; and 1,3,5,7,8-pentamethyl-2,6-diphenyl P-BF₂ complexes. The 1,3,5,7-tetramethyl P-BF₂ complex itself exhibits weak T-T absorption, which stretches from the green to the near IR spectral region. This band consists of two overlapping (differently polarized) T-T transitions. Short molecular axis (i.e., 8- and 1,7-positions) substitution causes the positively polarized T-T transition to gain considerably in intensity. Significantly, the negatively, long-axis polarized T-T transition was unaffected by the long-axis 2,6-position disubstitution. Therefore, only 2,6-position disubstitution is expected to produce superior new P-BF₂ complex laser dyes. Substitution effects from strongly interacting groups with chromophores on singlet-singlet (S-S) as well as T-T absorption spectra, together with cw laser photoselection spectroscopy, are briefly reviewed.



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